



**Calibration of the Flammable Gas Mass Flow Controllers  
For the PHENIX Gas System**

**PHENIX Procedure No. PP-2.5.5.6-02**

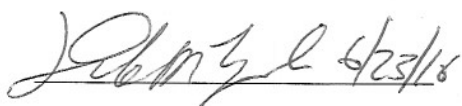
**Revision: E**

**Date: 6/23/2016**

**Hand Processed Changes**

<b><u>HPC No.</u></b>	<b><u>Date</u></b>	<b><u>Page Nos.</u></b>	<b><u>Initials</u></b>
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**Approvals**



PHENIX S E & I Date



Cognizant Scientist

Date



PHENIX QA/Safety Date

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## REVISION CONTROL SHEET

LETTER	DESCRIPTION	DATE	AUTHOR	APPROVED BY	CURRENT OVERSIGHT
A	First Issue	3/27/2001	n/a	J. Haggerty, M. Sivertz, W. Lenz, A. Etkin	n/a
B	No apparent change from rev A except date of issue	5/7/2001	n/a	n/a	R. Pisani
C	Reviewed and found to be up-to-date	11/24/2009	D. Lynch	P.Giannotti, D. Lynch, R. Pisani	R. Pisani
D	Reviewed and found to be up-to-date	1/25/2013	D. Lynch	P.Giannotti, D. Lynch, R. Pisani	R. Pisani
E	Corrected references 7.2 and 7.3 to the current correct SBMS, EHS standards. Otherwise, Reviewed and found the procedure to be up-to-date	6/23/2016	D. Lynch	P.Giannotti, D. Lynch, R. Pisani	R. Pisani

## **1. Purpose**

This document describes the procedure for certifying the calibration of the mass flow controllers used to mix flammable gases in the PHENIX Gas Mixing House.

It specifies the frequency the calibration must be performed.

It gives the tolerances for acceptable performance based upon the gases being mixed.

It describes the actions to take should any of the test results of the mass flow controllers' calibration fall outside of their acceptable limits.

## **2. Responsibilities**

It is the responsibility of the PHENIX Run Coordinator to insure that all the mass flow controllers used in flammable gas systems (see Appendix A) have passed the appropriate calibration test, and that the test certification is kept current.

The calibration test shall be performed by the PHENIX Gas Technician who is responsible for taking the gas sample and sending it to a gas analysis laboratory for testing. Results of the test shall be transferred to the Run Coordinator for certification.

## **3. Prerequisites**

The Gas Technician shall have read or have training in the following areas:

- 3.1 Local Emergency Plan for the Collider-Accelerator Project, C-A OPM 3.0,
- 3.2 BNL Compressed Gas Safety Training Course,
- 3.3 geographical layout of the experimental area (routes of egress, location of emergency equipment, phones and controls)

## **4. Precautions**

Before conducting any tests, the PHENIX Gas Technician shall inform the Run Coordinator that a sample of flammable gas is being taken.

## **5. Procedure**

The mass flow controllers shall be calibrated once a year, as per the manufacturer's specifications.

In order to certify the calibration of the mass flow controllers:

- 5.1 A sample of gas shall be taken from the gas mixer into a sample cylinder.
- 5.2 This sample cylinder is sent to a gas analysis laboratory to measure the relative fraction of the components in the gas mixture.
- 5.3 The result of the test is compared to the table in Appendix A to verify that the mass flow controller is functioning within acceptable limits.
- 5.4 If the result of the test shows that the mass flow controller is functioning within acceptable limits, it shall be certified.
- 5.5 If the result of the test is not acceptable, the mass flow controller shall be examined and adjusted in an attempt

to bring it within acceptable limits and the calibration procedure shall be repeated. The flammable gas shall be shut off until the mass flow controller calibration can be certified. Inert gas shall continue to flow, purging the detectors of any potentially flammable gas mixtures.

## **6. Documentation**

The Gas Technician shall keep a log book with all testing records. The log book shall indicate the date the sample was taken, the results of the test, and any action taken.

## **7. References**

- 7.1 C-A OPM 3.0, "Local Emergency Plan for the Collider-Accelerator Project."
- 7.2 BNL SBMS, ESH Standards, Section 1.4.0, "Compressed Gas Cylinder Safety", Nov. 14, 2011.
- 7.3 BNL SBMS, ESH Standards, Section 4.11.0, "Installation of Flammable Gas Systems (Experimental and Temporary Installations)", July 16, 2010 rev 3.2.

## **8. Appendix A**

- 8.1 Attachment 1: - Operational parameters for the MuID flammable gas system.
- 8.2 Attachment 2: - Operational parameters for the DC/PC flammable gas system.
- 8.3 Attachment 3: - Operational parameters for the TEC flammable gas system.

Attachment 1: Operational Parameters for the MuID Flammable Gas System

The nominal gas mixture for the MuID is 92% CO<sub>2</sub> and 8% Isobutane by volume. If the result of the gas analysis shows an isobutane fraction that is between the limits of 7.25% and 8.75%, then the mass flow controller shall be certified. If the isobutane fraction is outside of these limits, then the isobutane flowing to the MuID chambers shall be shut off until the mass flow controllers are recalibrated and recertified.

Attachment 2: Operational Parameters for the DC/PC Flammable Gas System

The nominal gas mixture for the DC/PC is 50% Argon and 50% Ethane by volume. If the result of the gas analysis shows an ethane fraction that is between the limits of 48% and 52%, then the mass flow controller shall be certified. If the ethane fraction is outside of these limits, then the mass flow controllers shall be recalibrated and recertified.

Attachment 3: Operational Parameters for the TEC Flammable Gas System

The nominal gas mixture for the TEC is 90% Argon and 10% Methane by volume. If the result of the gas analysis shows a methane fraction that is between the limits of 8% and 12%, then the mass flow controller shall be certified. If the ethane fraction is outside of these limits, then the mass flow controllers shall be recalibrated and recertified.